

IN THE CLAIMS:

Please AMEND the claims in accordance with the following:

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21-7. (ONCE AMENDED) A teaching model generating device for image processing, in which a subject object has the same or substantially similar shape as that of a reference object, and], the device comprising:

an image processing system with which a current three-dimensional position and/or posture of the subject object is recognized by carrying out pattern matching processing of an image of the subject based on a plurality of pre-determined teaching models of the reference object; and

29 an image-capture system, in advance of the recognizing, generating and storing the plurality of teaching models on the basis of respective image data produced by taking images of said reference object from a plurality of directions, wherein one of the reference object and an image pickup device is fixed to a movable part of a robot or is grasped with a hand of the robot, and said robot is operated for positioning to a plurality of different image pickup positions and directions, so that the image data respectively obtained at each of said different image pickup positions is stored as a teaching model.

2. (ONCE AMENDED) A teaching model generating device for image processing, in which a subject object has the same or substantially similar shape as that of a reference object, and], the device comprising:

an image processing system with which a current three-dimensional position and/or posture of the subject object is recognized by carrying out pattern matching processing of an image of the subject based on a plurality of pre-determined teaching models of the reference object; and

an image-capture system, in advance of the recognizing, generating and storing the plurality of teaching models on the basis of respective image data produced by taking images of said reference object from a plurality of directions, wherein the reference object is fixed to a movable part of a first robot or is grasped with a hand of the first robot, and an image pickup means is fixed to a movable part of a second robot or is grasped with a hand of the second robot, and any one of or both of said first and second robots is operated for positioning to a plurality of

different relative image pickup positions and directions, so that the image data respectively obtained at each of said different image pickup positions is stored as a teaching model.

4. (TWICE AMENDED) A teaching model generating device according to claim 1, wherein said teaching model is composed of data obtained by performing image processing on the image data of the reference object.

5. (TWICE AMENDED) A teaching model generating device according to claim 2, wherein said teaching model is generated for every direction in which said image pickup device took the image of said reference object and said teaching model is stored in association with information on the direction.

6. (TWICE AMENDED) A teaching model generating device according to claim 2, wherein said image pickup device is a camera.

7. (TWICE AMENDED) A teaching model generating device according to claim 2, wherein said image pickup means is a three-dimensional visual sensor whose image pickup device measures the distance between the image pickup device and a plurality of points on the object.

8. (NEW) A method for teaching model generation and image processing, comprising:

determining a current three-dimensional position and/or posture of a subject object by carrying out pattern matching processing of an image of the subject based on a plurality of predetermined teaching models of a reference object; and

in advance of the determining, generating and storing the plurality of teaching models on the basis of respective image data produced by taking images of said reference object from a plurality of directions, wherein one of the reference object and an image pickup device is fixed to a movable part of a robot or is grasped with a hand of the robot, and said robot is operated for positioning to a plurality of different image pickup positions and directions, so that the image data respectively obtained at each of said image pickup positions is stored as a teaching model.

9. (NEW) A method of automatic orientation recognition, comprising:

generating and storing a set of images of different relative orientations of a subject, the images having been captured by a plurality of robotic operations corresponding to the different relative orientations of the subject, and associating with each image information indicating its respective relative orientation of the subject;

with a known current orientation of a robot, capturing a current image of a workpiece that has an unknown orientation relative to the robot, where the workpiece has a shape substantially similar to the shape of the subject;

using pattern matching to match one of the stored images with the current image; and

determining the orientation of the workpiece relative to the robot based on the relative orientation information associated with the matched stored image, and also based on the known current orientation of the robot.

b2
10. (NEW) A method according to claim 9, further comprising automatically maneuvering the robot to the workpiece based at least on the determined orientation of the workpiece relative to the robot. c1

11. (NEW) A method according to claim 9, wherein the generating and storing is performed for a plurality of differently shaped subjects, wherein the current image includes a plurality of differently shaped workpieces, and wherein the pattern matching further comprises identifying the workpiece from among the plurality of differently shaped workpieces using the images and orientation information of the plurality of differently shaped subjects.

12. (NEW) A method of automatic orientation recognition, comprising:
generating and storing a set of images of different relative arrangements of a subject, the images having been captured by a plurality of robotic operations corresponding to the different relative arrangements, and associating with each image information indicating its respective relative arrangement of the subject;

with a known current arrangement of a robot, capturing a current image of a workpiece with an unknown current arrangement relative to the robot, where the workpiece has a shape substantially similar to the shape of the subject;

using pattern matching to match one of the stored images with the current image; and

determining the current arrangement of the workpiece relative to the robot based on the relative arrangement information associated with the matched stored image, and also based on

the known current arrangement of the robot.

b2 13. (NEW) A method, comprising:
robotically taking images of a subject with different subject-camera arrangements, and
associating with each image information indicating its subject-camera arrangement; then
taking a current image of a workpiece shaped like the subject; and then
determining a current workpiece-camera arrangement by matching one of the images
with the with current image, and using predetermined subject-camera arrangement information
of the matched image to determine the arrangement of the workpiece relative to the camera.
